Creative Self-Efficacy, Technology Acceptance and the Theory of Planned Behavior:

Antecedents to a Maker's Intention to Return to Make

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Abstract

A study of the antecedents to an individual's intention to return to make is proposed. Fab Labs, Makerspaces and Hackerspaces are part of a decentralized global Do-It-Yourself movement providing unique resources to tinkerers, hobbyists, inventors and artists to make almost anything. Individuals who use these facilities are often called "makers". This research seeks to understand why people intend to return to making by proposing a "maker" behavioral model blended from the theory of planned behavior, the technology acceptance model, and creative self-efficacy. A team-based competition, in which the teams compete to build an emergency toilet for the American Red Cross, will be used to study the maker model using a pre-test/post-test design that will question contestants about their attitudes toward creativity and making, technology, their experience with their contest team, openness to experience, and creative role identity; then examine the correlation with their intention to return to make. Additionally, self-assessments and independent assessments of creativity will also be correlated with the test results. It is hypothesized that all of these variables will be positively correlated to an individual's intention to return to make.

Creative Self-Efficacy, Technology Acceptance and the Theory of Planned Behavior: Antecedents to a Maker’s Intention to Return to Make

Fab Labs, Makerspaces and Hackerspaces, proliferating at a rapid pace, are all part of a decentralized global Do-It-Yourself movement providing unique resources to tinkerers, hobbyists, inventors and artists to make almost anything almost anywhere. These facilities become vehicles for bright inventive people who don’t fit elsewhere (Gershenfeld, 2015). The people using these facilities are called many things, but the most fitting moniker is “maker”. Makers make many things ranging from robots to furniture, food to mobile computing applications, or drones to wooden toys. The advent of these “making” facilities is a precursor to a new model of personal manufacturing that emphasizes mass personalization instead of mass production. This challenges everything. New tiers of making, manufacturing, social, and economic development become viable when it is possible to make things for one person or ten or a hundred people (Gershenfeld, 2015). This viability is further enhanced when it is possible to fabricate items globally by doing it locally across many locations, and shipping the data to make the product but not the product itself (Gershenfeld, 2015). This movement democratizes technology so that design and fabrication solutions are shared across a distributed global network of research and invention; and yet it maintains a personal context built upon projects of personal interest and import (Lassiter, 2015).

This paradigm shift presents many interesting questions, primary of which is “what makes a maker?” In other words, why do people engage in making initially and why do they continue making? Also, what influences a non-maker to become a maker? These are important to answer if Fab Labs, Makerspaces and Hackerspaces are to become commonplace in society for makers and non-makers alike.

Fab Lab Tulsa

One such organization, the Hardesty Center for Fab Lab Tulsa, was founded in 2011 with the mission of providing 21st century tools and equipment to the general public to make almost anything (Pritchett, 2014). An outgrowth of a program which originated at MIT, the Fab Lab concept brings together five pieces of computer controlled equipment into a single area for individuals to design and fabricate everything from shoes to electronic sensors, and nearly everything in between.

Fab Lab Tulsa, a 501(c)3 non-profit corporation, of Tulsa, Oklahoma USA, had nearly 16,000 visitors in 2013 including about 2,500 students (N. Pritchett, personal communication, 2013). Despite that traffic, the lab has only 300 dues-paying members and relies heavily on philanthropic foundations, corporations and individual donors to sustain its operations. This lab and other organizations like it seek to increase the number of dues-paying members because the earnings from memberships are not restricted to spending on specific programs, as donations from foundations and corporations often are. Unrestricted funds can be used any time for any purpose to satisfy any particular need of the organization.

Consequently, the success of these maker organizations depends in part on increasing its number of dues-paying members. One of the observations made by Fab Lab Tulsa staff since the lab opened is that such a wide array of fabrication equipment and design possibilities is simply overwhelming to many people, and therefore intimidating (N. Pritchett, personal communication, 2015). As a blank page is to the writer, so is the Fab Lab to a potential user. Fab Lab Tulsa has sought to overcome this barrier to usage by offering low priced introductory memberships, training classes, friendly staff and free hands-on technical support.

So what possibilities exist to boost the number of dues-paying members? To answer that it is essential to understand the intentions of the current members to continue making at Fab Lab and paying dues; and the intentions of first time users to return a second time to make again and become dues-paying members. Therefore, the central question of this research is to understand the antecedents to a maker's intention to return to make using a proposed maker behavioral model blended from the theory of planned behavior, the technology acceptance model, and creative self-efficacy. To examine this question the proposed research will use a design competition to survey contestants and teams about their attitudes regarding creativity, technology, teams, and their intention to return to make. The subject of the design competition will be to build a better functioning emergency toilet which can be used in disaster scenarios. Partnering with the Tulsa Chapter of the American Red Cross and Fab Lab Tulsa, the contestants will compete in all-ages teams of three to five individuals comprised of self-reported makers and non-makers.

This is not the first academic research involving Fab Lab Tulsa. The Center of Applied Research for Nonprofit Organizations (CARNO) from the University of Oklahoma-Schusterman Center in Tulsa conducted research focused on measuring the influence that Fab Lab Tulsa has on children's measures of self-perception and attitude regarding science, technology, engineering and math (STEM) experiences (Dubriwny, Pritchett, Mulhern, Hamby, & Norris, 2014). The study was conducted on school age children from Tulsa metro area schools wherein students used Fab Lab for a project, and were measured for self-perception with a pre-test/post-test design. The results indicate Fab Lab had a statistically significant effect on students' self-efficacy regarding STEM experiences.

Dubriwny et al's (2014) research and the proposed research are related. First, both research efforts involve a measurement of self-efficacy, though the proposed research would focus specifically on creative self-efficacy. Second, both the Dubriwny et al (2014) work and the proposed research use group-centered project activities studying participants' attitudes about building or making. Third, the proposed research, to some extent, extends the work of Dubriwny et al (2014) because it will seek to understand whether the research participants intend to return to Fab Lab Tulsa to continue making (e.g. if their creative self-efficacy influences that return), and also seeks to understand which variables might influence participants most to do so. Most importantly, work by Dubriwny et al (2014) indicates that the proposed research is possible and feasible within a maker environment.

Maker Behavioral Model Background

The proposed research will test a hypothesized model of maker behavior which attempts to explain the antecedents to a maker's intention to return to making. It is blended from the theory of planned behavior (TPB), the technology acceptance model (TAM), and creative self-efficacy. Each of these contributes to the proposed model in a different way. The theory of planned behavior forms the backbone of the model owed largely to its widespread use and acceptance explaining behavior. The technology acceptance model is essential because it is believed that it will help account for a maker's acceptance or reluctance to use the technology typically found in a Fab Lab or similar facility which is typically associated with making. Creative self-efficacy is a component of the proposed model because it is hypothesized that creativity and the creative process are integral to making.

Theory of Planned Behavior Background

Icek Azjen proposed the Theory of Planned Behavior in 1985 as an expansion of the Theory of Reasoned Action (Azjen, 1985). The theory of reasoned action traces the causal links from beliefs, through attitudes and intentions, to actual behavior; and focuses largely on behavior which is under a person's volitional control (Azjen, 1985). The TPB is applicable, however, when the probabilities of success and actual control are less than perfect; meaning that the success of an attempt to execute a behavior depends not only on the strength of the attempt but also on the person's control over other factors like information, skills, abilities, will power, time, opportunity, and so forth (Azjen, 1985). Overall, people will attempt a behavior if their referent social norms motivate them (sometimes called peer pressure) and if they believe the benefits of success outweigh the penalties of failure (their attitude toward the behavior). Further, they will succeed in their attempt if they have adequate control over internal and external factors (perceived behavioral control) (Azjen, 1985).

The TPB, shown in Figure 1 (Appendix 1), is widely used to describe behavior across a number of domains. It has been used to predict above-average participation in volunteerism (Greenslade & White, 2005) and also individual creative performance (Choi, 2012). It has also found use in identifying factors influencing teachers to use educational technology (Lee, Cerreto, & Lee, 2010) as well as studying offline and online civic engagement amongst young adults from different ethnic groups (Jugert, Eckstein, Noack, Kuhn, & Benbow, 2013).

Given its wide use and focus, the TPB is a relevant model for the proposed research about makers and their intention to return to making. The TPB will be examined through the blended maker model by customizing its major elements, namely social norms, attitude and perceived

behavioral control; and combining them with creative self-efficacy and the technology acceptance model.

Technology Acceptance Model Background

The Technology Acceptance Model (TAM) was introduced in 1986 by Fred Davis as an adaptation of the theory of reasoned action specifically tailored for modeling user acceptance of information systems (Davis, Bagozzi, & Warshaw, 1989). Ideally, the TAM is a model that is not only helpful for prediction but also explanation so that both researchers and practitioners can identify why a system is unacceptable and can pursue corrective steps (Davis, Bagozzi, & Warshaw, 1989). TAM postulates that a person's behavioral intention to use a system is influenced first by their beliefs about the system's ease of use and perceived usefulness, and second by their attitude toward using the system. Perceived usefulness, as well, influences behavioral intention (Davis, Bagozzi, & Warshaw, 1989). Finally, behavioral intention influences actual system use.

Technology ease of use shall be defined in the proposed research as the degree to which an individual perceives a particular piece of maker technology easy to use or free of effort (Davis, Bagozzi, & Warshaw, 1989). Perceptions of ease of use will vary between people and will vary depending on the sophistication of the technology.

Technology usefulness shall be defined as the prospective user's subjective probability that using a specific maker technology will increase his or her making performance within their team (Davis, Bagozzi, & Warshaw, 1989). Usefulness will be determined by the effectiveness of the technology at achieving the requirements of the creative effort or the desires of the maker.

Like TPB, TAM is used in several technology domains. See Figure 2 in Appendix 2. It is used in education to predict teachers' adoption of technology (Holden & Rada, 2011) and mobile

technology (Tsai, Want, & Lu, 2011). Further TAM helps to predict consumer acceptance of smart grid technology (Toft, Schuitema, & Thogersen, 2014), and nurses' acceptance of electronic medical record systems (Kuo, Liu, & Ma, 2013).

In the proposed research, maker technology shall be defined broadly as technology used in creative design or fabrication. The technology need not be digital nor computer-based, only that it is used in a creative pursuit. Design technology could range from paper-based sketching to computer aided design (CAD) tools, or variations thereof. Fabrication technology could be as simple as hand-crafted clay pottery to hand wood working tools to laser cutting to 3D printing.

Therefore, the TAM is especially appropriate to the proposed research given the observations of Fab Lab Tulsa staff about user's mixed reactions to the computing and fabrication systems in the lab. Perceived usefulness, ease of use and attitude are hypothesized as relevant factors for individuals deciding to use maker technology. With the TPB as the central portion of the proposed maker model, the TAM will contribute to the the intention to return to making with perceived usefulness and ease of use.

Creative Self-Efficacy Background

In the proposed research, creativity is defined as any creation which is novel, appropriate, and useful as determined by society or a group (Sawyer, 2012). This means that the context of a creation and its perceived usefulness will determine whether or not it is creative. With this definition creative products may range from knitting or other crafts to metal shapes machined with computer controlled equipment. Building upon creativity, creative self-efficacy is a domain-specific efficacy belief describing individuals' beliefs that they are able to generate creative outcomes (Bjornberg & Davis, 2015). Their attainment of such a creative behavioral goal is dependent on their control of the behavior involved (Azjen, 1985). In other words, in

creative pursuits those people with high creative self-efficacy believe they can develop novel ideas or solutions because of their high perceived behavioral control (PBC), an element of TPB.

Bjornberg and Davis (2015) demonstrate through a meta-analytic examination that there are five antecedents to creative self-efficacy in organizations, namely creative role-identity, openness to experience, workplace support, leadership, and workplace creativity expectations. In the proposed blended maker model, the antecedents workplace support, leadership, and workplace creativity expectations will not be examined specifically since it is assumed that the team environment of the proposed research will serve as a substitute. Two elements remain: creative role identity and openness to experience. Creative role-identity is an internalized identity developed by an individual over time based upon expectations placed upon them by others (Bjornberg & Davis, 2015). Creative role identity creates a motivational pull toward creative endeavors and engagement which increase creative self-efficacy over time. The final antecedent to creative self-efficacy, openness to experience, is a characteristic of those individuals' who are more open to new ideas and experiences, and more willing and confident to try new things (Bjornberg & Davis, 2015). Having such openness will lead to increased creative self-efficacy over time.

Altogether, the TPB, the TAM and creative self-efficacy are blended to form the proposed maker behavioral model. Specifically, the TPB is enhanced with the TAM and creative self-efficacy to produce the blended model, and the proposed research conducted during the emergency toilet design competition will test it.

Blended Maker Behavioral Model

The blended maker behavioral model is a modification of the TPB using components from the TAM and creative self-efficacy. The model is shown in Figure 3 in Appendix 3.

Elements noted as Future Research in Figure 1 are shown for reference only and are borrowed from research on sustained volunteerism wherein sustained volunteering is preceded by a volunteer identity, preceded by an intention to return to volunteering, preceded by an initial volunteer experience, preceded by an intention to volunteer (Penner, 2002). While it is desirable to understand sustained making, it is outside the scope of the proposed research to undertake longitudinal efforts to do so. Therefore, the key element of intention to return to make will be the foundation of the proposed model, with specific focus on how intention overlaps with the TPB and the TAM, shown in Figures 1 and 2, respectively.

Creativity is believed to be a key component of making, and so the elements openness to experience, creative role-identity, and creative self-efficacy are borrowed from research by Bjornberg and Davis (2015) about creative self-efficacy, as noted previously. Openness to experience shall be defined as the degree to which an individual is willing and confident to try new things (Bjornberg & Davis, 2015). It could be any new experience but in the proposed research, an example includes team members embracing the challenge of designing an emergency toilet perhaps with no experience with plumbing fixture design.

Creative role-identity shall be defined as an internalized identity developed by an individual over time based upon expectations placed upon them by others (Bjornberg & Davis, 2015). Consequently, this identity has a social context. For example, in the workplace, team members may view one person as particularly creative. Those expectations would influence that team member to internalize and develop a creative role-identity.

Finally, creative self-efficacy, in the context of the proposed research, is the same as PBC, an element of the TPB. Therefore creative self-efficacy is used instead of PBC because it has a

demonstrated relationship to creative role-identity and openness to experience, so enabling the proposed research to test relationships of creativity to intention to return to making.

The elements team efficacy, intention to return to make, and PBC (creative self-efficacy) are borrowed from the TPB. Team-efficacy is used instead of subjective norm because the proposed research will use teams of individuals who have self-selected to participate in the competition. Therefore, testing for subjective norm is unnecessary because team norms already support intention to make. Team-efficacy will be used instead to test the relationship of team attitudes and environment to intention to return to making. In this context, team-efficacy shall be defined as an individual team member's assessment of the collective team's belief that the team can successfully design an emergency toilet.

The elements ease of technology use and usefulness of maker technology are borrowed from the TAM. They are used to test the relationship of technology to both creative self-efficacy and intention to return to making. Regarding ease of technology use it is believed that an individual who finds technology easy to use will have higher creative self-efficacy (PBC) because if they can effectively use technology for making then their belief that they can use the technology to generate creative outcomes will be enhanced. With regard to the usefulness of maker technology, its relationship to intention to return to make is essential to understand because experience at Fab Lab Tulsa demonstrates that technology usage is a barrier to making.

Hypotheses

Having described the blended maker behavioral model and explained its connections to other models, there are numerous hypotheses to test.

Hypothesis 1: The alternate hypotheses will be that the intention to return to make will change due to first-order influence of an individual's perception of technology usefulness, creative self-efficacy, and team-efficacy.

Hypothesis 2: Individual identification as creative will correlate positively with an individual's creative self-efficacy.

Hypothesis 3: Openness to Experience will correlate positively with an individual's creative self-efficacy.

Hypothesis 4: User's attitudes about technology's usefulness will correlate positively with an individual's intention to return to make.

Hypothesis 5: Creative Self-Efficacy will correlate positively with an individual's intention to return to make.

Hypothesis 6: An individual's experience with their contest team will correlate positively with an individual's intention to return to make.

Hypothesis 7: An individual's creativity assessment (either self or independently judged) will correlate positively with an individual's intention to return to make.

Hypothesis 8: User's attitudes about technology ease of use will correlate positively with an individual's creative self-efficacy.

Hypothesis 9: User's attitudes about technology ease of use will correlate positively with an individual's attitude about the technology's usefulness.

Methods

Participants

Participants in the study will be members of the general public who register as teams for the toilet design competition. Per rules of the contest, registered teams shall have a composition

of members with no less than 50% new users, and no more than 50% experienced users. Teams with an even number of members may be split 50/50. Teams with an odd number of members shall be majority new users. Teams are expected to recruit their own members within the confines of the published rules. The competition will be limited to about 100 participants, and about 20 teams, with teams limited to no more than five members. Participants will have incentive to register for the competition for several potential reasons. These may include, but are not limited to: the excitement afforded them by the challenge, the prestige of participating, the chance at and prestige of winning, potential entrepreneurial pursuits to commercially develop their design, or a service related desire to fulfill a valuable social need with an innovative product.

Participants will self-register for the competition based upon interest and may or may not be demographically representative of the Tulsa area population. The design of the study will have no influence on the selection of participants except that it is anticipated the sample will represent individuals who are both tightly and loosely connected to Fab Lab Tulsa through friends or associates. As such the sample will likely be majority male, ages 30-49, based on the current demographics of Fab Lab Tulsa members (King, Holbrook, Sanders, & Williams, 2014).

Measures

Several elements will be measured. Creative self-efficacy, technology acceptance, team efficacy, creativity and intention to return to make will be measured in this study with instruments which are valid and reliable will be used from prior research. Likewise, self-perceptions of the team and independent judgments of creativity will also be measured. Self-perception of the team will be measured by each participant as an individual and personal assessment of their team's creativity. Independent judgements of creativity will be made by an

independent panel of judges. The instruments for all measures shall be appropriate for pre-test/post-test design, and will be applied on new and experienced users alike. The measures are explained.

Intention to return to make. Greenslade and White's (2005) 7-point Likert scales on intention ($\alpha = 0.97$) to volunteer shall be used, with minor modification for application to the research. An example is "It is likely that I will engage in three or more hours of making during the next month."

Creative role identity. Farmer, et al (2003) used 5-point Likert scales to measure creative role identity in employees ($\alpha = 0.80$). These shall be modified for this research. A sample is "I often think about being creative."

Openness to experience. The International Personality Item Pool (Goldberg, 2006) for "Openness to Experience, NEO Domain", the 10-item scale, ($\alpha = 0.82$) will be used for this measure; using a 5-point Likert scale. A sample is "Please use the rating 5-point scale to describe how accurately each statement describes you: Have a vivid imagination."

Creative self-efficacy. Seo, et al (2015) used 7-point Likert scales to measure creative self-efficacy of IT employees ($\alpha = 0.868$). These shall be modified for this research. A sample is "I have confidence in my ability to solve problems creatively."

Team-efficacy. Choi (2004) used 7-point Likert scales to measure open group climate in research to understand creative performance ($\alpha = 0.73$). These shall be modified for this research. A sample is "As a group, we feel that each one of us needs to contribute to project discussions, design, and fabrication."

Perceived technology usefulness. Teo, et al (2012) used 5-point Likert scales to measure perceived usefulness with computers (composite reliability = 0.95). These shall be modified for this research. A sample is "Using technology will improve my making."

Perceived technology ease of use. Teo, et al (2012) used 5-point Likert scales to measure perceived ease of use with computers (composite reliability = 0.91). These shall be modified for this research. A sample is "I find technology easy to use."

Creativity. Creativity will be rated with two methods, each based on Choi's (2004) research on creative performance (reliability = 0.70), using 7-point Likert scales. These shall be modified for this research using the Sawyer (2012) definition of creativity. First, each individual team member will rate their team's emergency toilet for creativity. Second, an independent team of judges will rank the emergency toilets for creativity. A sample item is "The emergency toilet design presents new/fresh ideas in a creative solution."

Design

Several operational definitions are required. Those not previously defined include new and experienced users, the design competition, Fab Lab Tulsa memberships, and team-efficacy.

New and experienced users shall be defined by their self-reported proficiency with using maker technology or Fab Lab equipment. New users shall be defined as those individuals who self-report not having used any piece of maker technology on their own within the last 365 days. They may have helped someone in the lab or visited the lab recently but they cannot have used any equipment independently, nor could they with their present skill level expect to complete a project, however small, without assistance. Experienced users shall be defined as those individuals who self-report having the self-confidence to complete a project from concept to completion, however small, on their own using one or more pieces of maker technology. They

may not consider themselves an expert, nor must they be considered an expert by others. They must only self-report having confidence to complete a project using maker technology.

The design competition shall be defined as a themed design challenge undertaken by all teams. The inaugural competition shall be to design and build an emergency toilet which would be valuable in a disaster scenario. The winning team will produce a design which is sanitary, useful, compact to ship, easy to assemble with the crude tools available in the aftermath of a disaster, durable, and which could be made from a variety of materials available in a disaster zone. Teams may not produce the same toilet design but all will be judged against the same criteria.

An operational definition would also include who is counted as Fab Lab member. A member is counted as an individual who has purchased an individual or family membership to Fab Lab Tulsa which has not yet expired.

Team-efficacy shall be defined in the proposed research as an individual's belief that their team will achieve the goals which it has set for itself. If individual team members believe the team collectively had the skills, opportunity, and collective ability to cooperate and work together, then that team would have high team-efficacy.

A factorial MANOVA within subjects test will be the statistical test of choice. The groups will be pre and post-test interval data for openness to experience, creative role identity, technology ease of use and usefulness, team-efficacy, creative self-efficacy, and intention to return to make. This test is appropriate as there are multiple independent variables (openness to experience, creative role identity, technology ease of use, and team-efficacy) and multiple dependent variables (creative self-efficacy, technology usefulness, and intention to return to

make). A X^2 goodness of fit or test of independence might be valuable depending on what nominal data is collected.

Confounding variables may include the mere excitement surrounding the competition, as well as the expertise of the experienced users and the overall effectiveness of the teams. Any one of these variables could cast into doubt the influence of team-efficacy or creative role-identity, especially if there are intra-team conflicts which prevent the team from achieving its results or if the experienced users are unable to teach or mentor the new users adequately. On the other hand, the excitement surrounding the competition may drive-up user confidence, increase openness to experience or encourage intention to return to make. Controlling these variables will be a key test of the instrument chosen to measure creative self-efficacy. The scales must allow respondents to isolate and identify the influence of the team-based learning approach separate from these confounds.

Procedure

Test procedures include data collection and analysis. Following IRB approval, data collection will be conducted via online instrument and survey tools to collect data on technology ease of use, technology perceived usefulness, openness to experience, creative role-identity, creative self-efficacy, team-efficacy, intention to return to make and demographics for every participant regardless of experience. Three or more survey gates will be applied throughout the study; before the competition (pre-test), during the competition (post-test 1), and after the competition (post-test 2). The surveys will contain the same scales but each will be reverse-coded in order to disguise the repeated measures. Since the competition is expected to span eight to ten weeks, the survey during the competition will measure the blended maker behavioral model as the teams are in the midst of work, helping to control for any euphoric survey impulses

before or after the competition. The data will be analyzed with IBM's SPSS software (IBM Corp., 2013).

Proposed Analysis and Anticipated Results

Measuring the influence of creative self-efficacy, technology ease of use and usefulness, and team-efficacy on intention to return to make as operationalized through a design competition is proposed. A factorial within subjects MANOVA will be used analyze the results, in anticipation of demonstrating with statistical significance that creative self-efficacy, technology ease of use and usefulness, and team-efficacy improve measures of individuals' intention to return to make. For this study $\alpha = 0.05$, and for a significance value (sig) $\leq \alpha$, the null hypothesis will be rejected, thereby demonstrating that creative self-efficacy, technology ease of use and usefulness, and team-efficacy show statistically significant evidence that they are effective at increasing individuals' intention to return to make.

If creative self-efficacy, technology ease of use and usefulness, and team-efficacy are affective, new users who participate in the design competition are expected to increase their scores for their intention to return to make at Fab Lab Tulsa or other places. Experienced users are not expected to improve scores, but to remain consistent.

Study Limitations and Anticipated Implications

The study will have several limitations and implications. The limitations may include those related to the sample, and to the ability of the results to be generalized outside of the confines of the study. The sample may represent the demographics of the current Fab Lab Tulsa members but may not be representative of the general population. The consequences of an unrepresentative sample, as a limitation, may also have negative implications since Fab Lab and similar organizations seek to attract the general public to become makers. There are also

limitations for generalizing the study beyond a design competition. It is unknown, and will not be addressed by the study, whether it is the design competition scenario or creative self-efficacy, technology ease of use and usefulness, and team-efficacy which increase intention to return to make.

If the null hypothesis is rejected, and the study demonstrates that creative self-efficacy, technology ease of use and usefulness, and team-efficacy increase individuals' intention to return to make, then the implications will have ramifications for Fab Lab and maker organizations around the world for a number of reasons.

First, the study would help illuminate the barriers created by technology. It would not only indicate that the numerous anecdotal observations about the barriers created by intimidating maker technology are not illusory but also offer a way to overcome those barriers by providing some insight into the interactions between people, technology, creativity and making. If one believes that the Fab Lab and maker movements represent new paradigms of design, invention, economics and social impact then, in a broader sense, understanding those interactions is essential to the any community's future.

Second, the study would be a model for engaging a Fab Lab's community through a structured design competition. With labs having identical equipment and operating parameters, design competitions could be scaled within labs, between labs, between countries and continents. The promise of using design competitions to build global relationships among labs is not new, but a template for conducting a competition which is coupled with social metrics and social benefit is uncommon, and would be a benchmark for labs to examine. Further, these metrics would provide data which may aid an organization's decisions about memberships, technology, or training programs.

Finally, Fab Labs are relatively new to the world having only been founded as a movement in 2001. These organizations are ripe for academic research and this study would certainly be one of only a few of this category known to the author which exists. To help establish the "canon" of Fab Lab academic literature would be valuable.

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Appendix 1

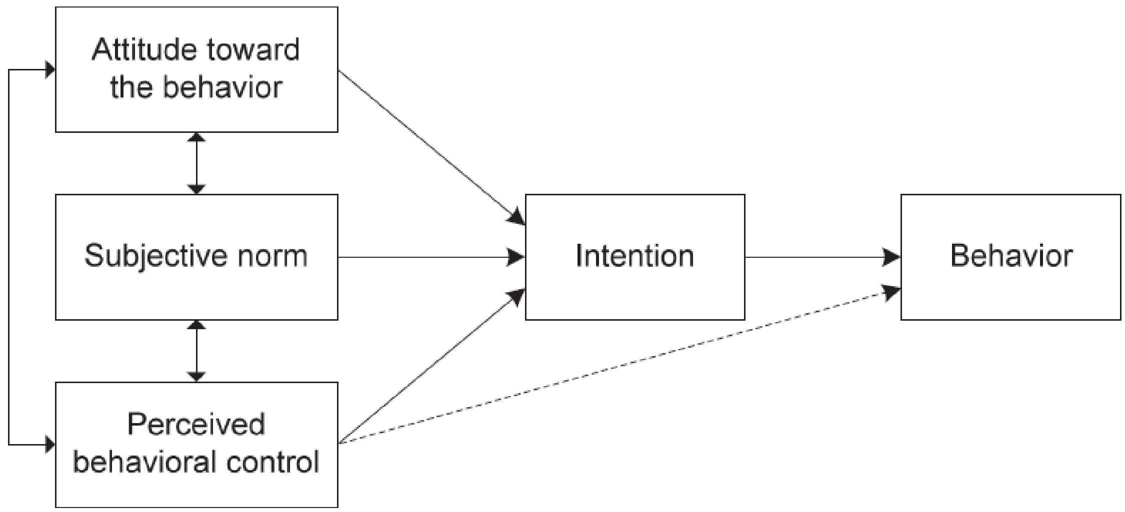

Figure 1 – Theory of Planned Behavior Model (Azjen, 2002)

Appendix 2

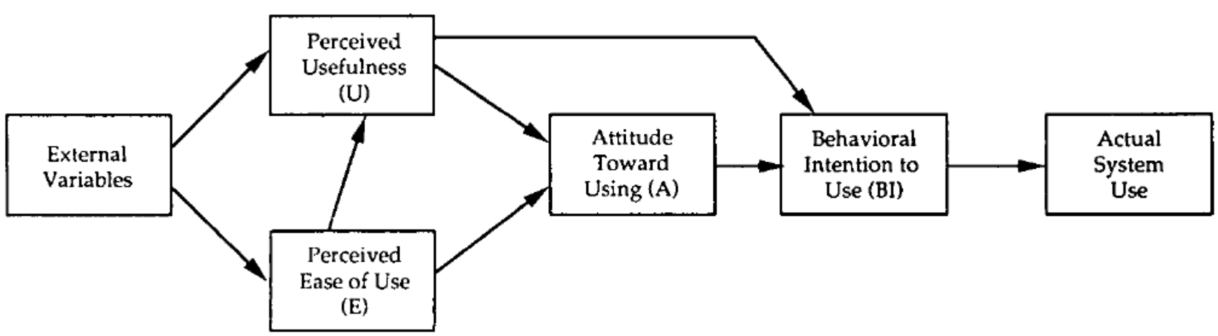

Figure 2 – Technology Acceptance Model (Davis, Bagozzi, & Warshaw, 1989)

Appendix 3

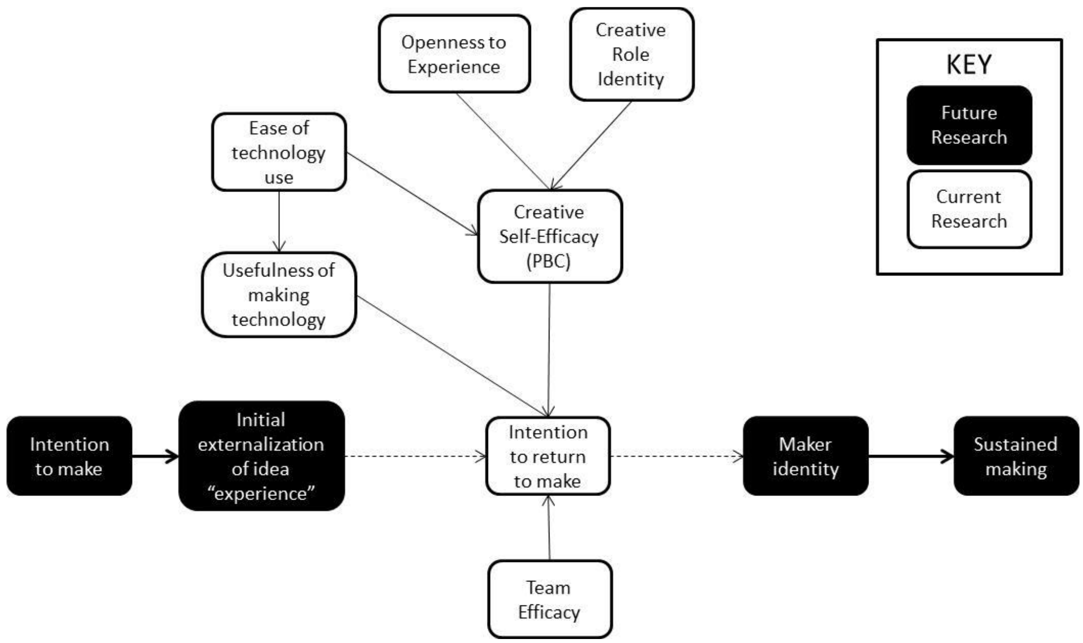

Figure 3 – Blended Maker Behavioral Model